

## PATENT SPECIFICATION



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## COMPLETE SPECIFICATION

## Improvements in and relating to Telephone Installations

We, CARL LEHNER, META GADESMANN, KARL LEICHTHAMMER and HERMANN LEICHTHAMMER, all German citizens, sole personally responsible partners of and trading in partnership as TELEFONBAU UND NORMALZEIT LEHNER & Co., of 134/140, Mainzerlandstrasse, Frankfurt a. Main, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to telephone exchange systems in which means are provided for the emission of a code signal for calling a wanted party who fails to reply when called in the normal way and for preparing a common talking circuit through which the wanted party can connect himself to the calling party by dialling a special number from any one of a number of substations. In the systems of this kind which have so far been proposed, the calling party has to make a special supplementary dialling operation in order to cause the code signal to be emitted, and alterations and additions have to be made to the selecting switch arrangements with which each instrument is provided.

The object of the invention is to simplify such systems.

In the system in accordance with the invention, in the event of no reply being received from a wanted party, the common talking circuit is automatically connected to the wanted party's line and the code signalling device is brought automatically into operation. With such an arrangement, the wanted party, on observing that he is being signalled, can get into touch with the caller by simply lifting his receiver. It can also be arranged that he can reply from an instrument other than his own, but in that case, the connection is only made on his dialling a special number. As the common talking circuit is connected to the wanted party's line as distinct from his instrument, no alterations or additions need be made to the selecting switch arrangement with which that instrument is provided, and all switch means which have to be

provided for making the connection through that circuit and bringing in the code signalling device can be grouped as a unit which can be very simply connected to the wanted party's line. This makes it easy to convert an existing system.

In order that the invention may be properly understood and be more readily carried into effect, an example in accordance therewith will now be described with reference to the accompanying drawing which illustrates the essential circuits of a telephone exchange system in accordance with the invention.

On the left of the drawing, a telephone instrument is indicated at T1 which, in the ordinary manner, works in conjunction with a finder switch AS1 and a final selector LW1. If a party at T1 wishes to hold a conversation with a party at T2, he sets the final selector LW1 so as to cause the wanted party to be rung. The ringing current runs through the subscriber's loop. One speech wire of the wanted party's line includes the winding I of a relay A which is slow-to-attract and therefore does not respond to the ringing alternating current controlled by the final selector LW1. In the auxiliary wire of the line there is a relay C which, when the wanted party's line is seized by the final selector LW1, is energised and connected in series with the usual subscriber's relay T. The contact c1 of the relay C serves to close a circuit through the contact u3 to the thermo-relay Th of a time switch. If the wanted party at T2 removes his receiver, direct current is caused to flow through the line so that a relay (not shown) in the final selector LW1 is energised, the alternating ringing current stopped, and the talking circuit completed. The relay A responds and short-circuits the relay C at its contact a1. When the relay C drops, the contact c1 opens the time switch circuit.

If, however, there is no reply from the wanted party, the thermo-relay Th heats up and throws its contact th so that the two-step relay U makes its first step. The contact u3 is then thrown so that the thermo-relay cools down again. The

contact *u3* bridges the contact *th*. When, after the thermo relay *Th* has cooled down, the contact *th* returns to the normal position, it short-circuits the resistance *W* so that the relay *U* receives an amplified current and makes its second step. In closing, the contact *u1* connects the relay *P* in a circuit running to a code signalling device.

10 This signalling device comprises a stepping mechanism having a driving magnet *D* and wipers which move over a bank of contacts wired in accordance with the wanted party's code signal. In order that it may only be seized by one party at a time, the relay *P* of each privileged party to whom a code signal can be given is provided with a high ohmic and a low ohmic winding, the high ohmic winding being short circuited by the contact *p1* so as to prevent the device from being seized again before release. When the relay *P* responds, the wanted party's relay *M* is also energised so that a holding circuit is closed at the contact *m5* and a code signalling circuit is prepared by the contacts *m2*, *m3* and *m4*. The contact *u2* closes a circuit in which the relay *RI* is energised. This relay forms, together with the relay *RII*, a relay interrupter which intermittently energises the driving magnet *D* of the stepping mechanism. The shaft of the stepping mechanism controls a shaft contact *w1* which stops the stepping switch in the normal position and a shaft contact *w2* which closes a starting circuit, for example, through a source of alternating current. The contacts of the contact bank of the stepping mechanism through which the code signalling circuit is to be closed are connected to earth by the contacts *m2*, *m3* and *m4*. A relay *L* connected to the wiper, by means of its contacts *l1* and *l2*, connects the source of ringing current at each energisation to the line to which signalling devices such as alarms or horns are connected in the various places in which the wanted party is likely to be found. Thus, the code signal is given whenever the wiper encounters a contact which is connected through a contact of the relay *M*. By earthing a single contact or a number of adjacent contacts, short or long signals as in Morse signals can be given.

60 The wanted party can now get into communication with the calling party either from his own or from any other instrument. If he replies from his own instrument, then, as has already been described, when he lifts the receiver, the relay *A* responds and short-circuits the relay *C* which interrupts the code signal at its contacts *c1* and *c2*. When the relay *P* drops, the code signalling device is released again and can then be seized by another party. By lifting his receiver, the wanted subscriber is connected to the calling party over the operated final selector *LW1*. If he replies from an instrument other than his own, he can make the connection to the calling party over a common talking circuit by dialling a special number. If he selects a free line to the code signalling device through the final selector *LW2*, the relay *G* in the testing wire responds and so does the relay *A* (winding II). By means of contact *g1*, the relay *G* puts a holding choke *DR* into the common talking circuit connected to the wanted subscriber's line at the contacts *p3* and *p4*. A direct current circuit is thus made for the two final selectors *LW1* and *LW2*, and the relay *G* in this circuit responds and interrupts the code signal. By means of its contact *a1*, the relay *A* short-circuits the relay *C* so that the relays *M* and *U* are de-energised. The relay *P* remains energised, however, through a winding in series with the relay *A*. Further seizing of the code signalling device is prevented by opening of the contact *g2*. The contact *g3* cuts out the relay *L* so that no signals are emitted while the stepping mechanism steps into its normal position. The two parties are now effectively connected by the contacts *p3* and *p4*. Release is effected in the usual manner when the receivers are replaced. The circuits for the relays *G*, *P*, *A* are also interrupted so that the code signalling device becomes accessible to another party.

As a rule, there will only be a few privileged parties who can receive the code signal, for example, the more important members of a business staff. It may be desirable that listening-in to conversations may be completely prevented and, in particular, that should be wanted party answer from an instrument other than his own, others should be unable to listen-in from the wanted party's instrument. No extra relays are necessary for this. It is only necessary to provide the relays *P* and *M* with contacts *p2*, *p6* and *m1*, *m6* (shown framed in the drawing) which are necessary in any case.

During automatic calling through the final selector *LW1*, only the relay *C* is energised. The ringing current runs to the wanted party's instrument through the normal side of the contacts *p2* and *p6*, by-passing the contacts *m1* and *m6*. The outgoing traffic is also handled by this route.

If there is no reply and the code

signal is in operation, the relays P and M are energised as well as the relay C, so that the wanted party's bell continues to be supplied with ringing current. If  
 5 the wanted party replies on his own instrument, after response of the relay A and release of the relays P and M, the talking circuit runs through the normal side of the contacts p2 and p6. There  
 10 is no interruption of the loop as the contacts p2 and p6 form a bridge.

If the wanted party replies from another instrument, the relay P remains energised for the duration of the conversation while the relay M is de-energised by the dropping of the relays C and U. The  
 15 wanted party's instrument is therefore disconnected by the contacts m1 and m6. Listening-in is thus made impossible.

20 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

25 1. A telephone exchange system of the kind set forth in which, in the event of no reply being received from a wanted party, the common talking circuit is automatically connected to the wanted  
 30 party's line and the code signalling device is automatically brought into operation.

35 2. A telephone exchange system according to Claim 1, in which the automatic connection of the wanted party's line is effected by switch means associated with that line.

40 3. A telephone exchange system according to Claim 1 or Claim 2 comprising a relay in the wanted party's line which is energised when the wanted party replies from his own instrument and a relay in the testing wire which releases on  
 45 energisation of the above-mentioned relay.

50 4. A telephone exchange system according to Claim 3, in which the relay in the wanted party's line is also energised when the wanted party replies from an instrument other than his own.

55 5. A telephone exchange system according to any preceding Claim comprising a time switch which is started when a call is made and prepares a circuit for seizing and operating the code signalling device.

60 6. A telephone system according to any preceding Claim, in which the code signalling device comprises a rotary switch, the contacts of which are wired to enable different signals to be emitted when different parties are called.

7. A telephone exchange system accord-

ing to any preceding Claim, in which the code signalling device is released when  
 65 the wanted party replies from his own instrument.

8. A telephone exchange system according to any preceding Claim, in which the  
 70 wanted party's line is disconnected when the wanted party replies from an instrument other than his own.

9. A telephone exchange system according to Claim 8, in which the disconnection is effected by the opening of a pair of  
 75 contacts, which opening occurs when the wanted party replies from any other instrument.

10. A telephone exchange system according to Claim 8 or Claim 9, comprising a relay which remains energised  
 80 only if the wanted party replies from an instrument other than his own and which thus maintains the wanted party's line disconnected from the common talking  
 85 circuit.

11. A telephone exchange system according to Claim 10, in which the said relay has a pair of make-and-break  
 90 contacts which serve to maintain the connection made when the wanted party replies from his own instrument, only as long as they remain in their normal position.

12. A telephone exchange system  
 95 according to Claim 11, in which outgoing traffic from the wanted party's instrument is carried over the said contacts in their normal position.

13. A telephone exchange system  
 100 according to Claim 11 or Claim 12, in which the ringing current is transmitted to the wanted party's instrument over the said contacts in their normal position until the time switch becomes operative.  
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14. A telephone exchange system according to Claims 9 and 13, in which, on the time switch becoming operative, the ringing current is transmitted through  
 110 the two pairs of contacts in operative position.

15. A telephone exchange system according to any preceding Claim, in which the code signalling device can be  
 115 connected to an instrument without necessitating alterations or additions to the selecting switch arrangements of that instrument.

16. A telephone exchange system according to Claim 15, in which the  
 120 selecting switch means for the code signalling device are constructed as a unit which can be simply connected to a line.

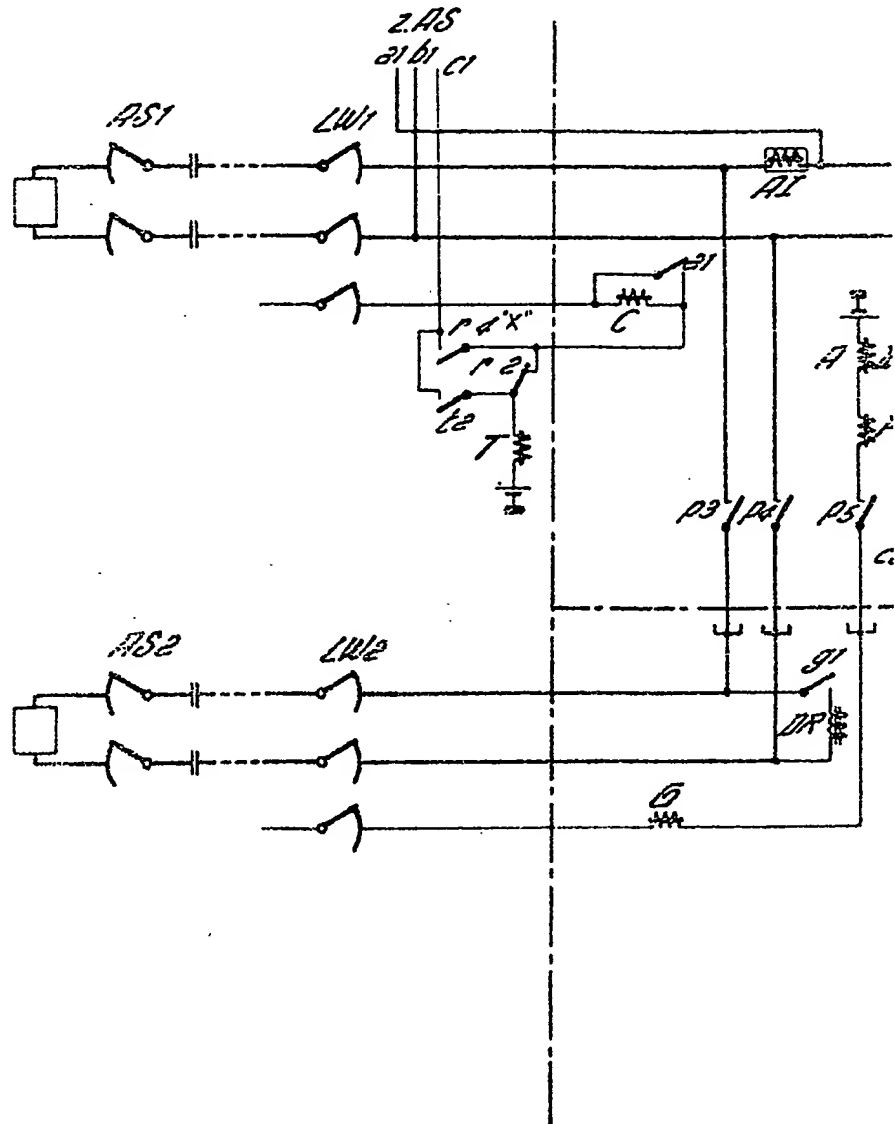
17. A telephone exchange system substantially as described with reference to  
 125 the accompanying drawing.

Dated this 9th day of June, 1937.

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